Independent Verification & Validation Program	Enterprise Architecture (IT Governance) Process	IVV 11 Version: C Effective Date: May 14, 2014

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AUTHORITY		DATE
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REFERENCES	
Document ID/Link	Title
IVV QM	NASA IV&V Quality Manual
IVV 04	Program Support Office Services Request Process
IVV 07	Financial Data Control
IVV 10	Software and Hardware Configuration Management
IVV 16	Control of Records
IVV 20	NASA IV&V SWAT Request Process
NPD 2830.1	NASA Enterprise Architecture
NPR 1441.1	NASA Records Retention Schedules
NPR 2830.1	NASA Enterprise Architecture Procedures
NPR 7120.5	NASA Space Flight Program and Project Management Requirements
NPR 7150.2	NASA Software Engineering Requirements

If any process in this document conflicts with any document in the NASA Online Directives Information System (NODIS), this document shall be superseded by the NODIS document. Any external reference shall be monitored by the Process Owner for current versioning.

1.0 Purpose

The purpose of this system level procedure (SLP) is to establish a procedure to ensure a consistent method for Information Technology (IT) governance for the NASA IV&V Program and its related business functions. This will be governed by the NASA IV&V Enterprise Architecture Board (EAB).

This SLP outlines the process for identifying, tracking and approving IT changes for a new capability that is outside the scope of a currently provided IT service and/or a change to the "As-Is" IT architecture, or for a new capability or resource to add to a current IT service and network capability that are brought forward by the NASA IV&V Program community. The EAB will serve as a functional component to the NASA IV&V IT infrastructure and related components to ensure the IV&V program is consistent with how it handles IT expenditures/processes and overall governance.

The outcome of SLP IVV-11 process is to answer the questions: who, what, where, why, when, and how. Answering these 6 basic questions will provide the information needed to make an informed decision that is best for the IV&V Program. Through this guided decision-making process, the IV&V Program will be able to meet its strategic goals and objectives with expected outcomes.

2.0 Scope

This SLP encompasses IV&V Program functions as they affect and relate to NASA IV&V IT. This includes all facilities/systems and business processes that affect the NASA IV&V Program, including partners, tenants, contractors, and related personnel. The EAB falls under NASA Policy Directive (NPD) 2830.1, *NASA Enterprise Architecture*.

3.0 Definitions and Acronyms

Official NASA IV&V roles and terms are defined in the Quality Manual. Specialized definitions identified in this SLP are defined below.

3.1 Application Architecture

The Application Architecture describes how NASA information systems should be designed, how they cooperate with each other, and what factors to consider in their deployment. It also serves as the focal point for an application systems inventory for NASA.

3.2 Architecture

Architecture is the structure of components, their interrelationships, and the principles and guidelines governing their design and evolution over time.

3.3 Baseline Architecture

See Enterprise Architecture (EA) “As-Is”.

3.4 Business Architecture

The Business Architecture defines what, where, and by whom the work of the Agency is performed. As the knowledge base for the EA, the Business Architecture provides a business-driven approach for determining the proper information, applications, and IT required by the enterprise.

3.5 Business Process

A business process is a collection of related, structured activities or tasks that produce a specific service or product (serve a particular goal) for a particular customer or customers. It often can be visualized with a flowchart as a sequence of activities with interleaving decision points or with a Process Matrix as a sequence of activities with relevance rules based on data in the process.

3.6 Business Reference Model (BRM)

The BRM provides a hierarchical structure for the business operations of the Federal Government. The BRM identifies four business areas that provide a high-level view of the operations the Government performs: Services for Citizens, Mode of Delivery, Support Delivery of Services, and Management of Government Resources.

3.7 Business Requirement

Business requirements are needs that must be fulfilled to achieve a high-level objective.

Note: Confusion arises for three main reasons: (1) a common practice is to refer to objectives, or expected benefits, as “business requirements.”
(2) People commonly use the term “requirements” to refer to the features of the product, system, or software expected to be created.
(3) A widely-held model says these two types of requirements differ only in level of detail or abstraction—wherein “business requirements” are high-level and vague and decompose into product, system, or functional requirements that are detailed.

3.8 Data Architecture

The Data Architecture provides an understanding of what information is needed to effectively execute the enterprise's business processes and provides a framework for effectively managing the enterprise's information environment. The Data Architecture links information behavior (i.e., accessing, using, and sharing data), information management processes, and information support staff to other aspects of the enterprise.

3.9 Data Reference Model (DRM)

The DRM describes the data and information that support programs and lines of business operations, and aids in describing the types of interaction and exchanges that occur between the Agency and its various customers, constituencies, and business partners. The DRM categorizes information into content areas, establishes a commonly understood classification for Federal data, and streamlines processes associated with information

exchange both within the Agency and between the Government and its external stakeholders. The DRM helps to identify duplicative data resources.

3.10 Enterprise Architecture (EA)

Enterprise Architecture is an explicit description and documentation of the current and desired relationships among business and management processes and information technology. An Enterprise Architecture includes principles, an architecture framework, a technical standards profile, current and target architectures, and a transition strategy to move from the current to target architecture.

3.11 Enterprise Architecture (EA) "As-Is"

The EA "As-Is" is the set of IT products that outline the existing enterprise, how it meets the IV&V Program goals and objectives and technical infrastructure. It is also referred to as the "As-Is" Architecture, the Baseline Architecture, or the Current Architecture.

3.12 Enterprise Architecture Board (EAB)

The EAB is a board of NASA IV&V Senior Staff, the EA Official and other stakeholders whose goal is to facilitate cohesion between IT and the IV&V Program, as well as a mapping between IV&V Program goals and objectives and the underlying IT needed to support them.

3.13 Enterprise Architecture (EA) Official

The EA Official is responsible for defining all of the overall processes and logistics related to EA actions, as well as helping the Initiator of the request to define and direct the EA action.

3.14 Functional Requirement

Functional requirement is a detailed breakdown that explains how the outcome of request will operate to meet the specified business requirement.

3.15 Implementation Team

The Implementation Team is the team that is responsible for implementing EA actions from both feasibility and operational standpoints. This team will perform due diligence before any EA action is approved and will also be responsible for implementing the final solution.

3.16 Initiator

The Initiator is any individual or group that initiates the request for a new business requirement to be brought before the EAB.

3.17 Management Process

A process of planning and controlling the organizing and leading execution of any type of activity, such as:

- A project (project management process) or
- A process (process management process, sometimes referred to as the process performance measurement and management system).

The organization's senior management is responsible for carrying out its management process. However, this is not always the case for all management processes. For example, it is the responsibility of the project manager to carry out a project management process

3.18 Reference Architecture

The Reference Architecture is a graphically represented, high-level system overview that is intentionally free of implementation details. It generally includes high-level descriptions of the system components, a definition of relationships between components, definitions of relationships between system components and elements external to the system, and identification of performance drivers and capacity requirements. Where applicable, a Reference Architecture also provides high-level definitions of: key data sources, data stores produced, and interfaces between the system components.

3.19 Service Reference Model (SRM)

The SRM is a business and performance-driven, functional framework that classifies service components with respect to how they support business and/or performance objectives. The SRM is intended to support the discovery of Agency-wide business and application service components in IT investments and assets. The SRM is structured across horizontal and vertical service domains which, independent of the business functions, can provide a foundation to support the reuse of applications, application capabilities, components, and business services.

3.20 System Development Life Cycle (SDLC)

The SDLC is the scope of activities associated with a system, which encompasses the system's initiation, development and acquisition, implementation, operation and maintenance, and ultimately, its disposal, which may instigate another system's initiation.

3.21 Technical Reference Model (TRM)

The TRM identifies and describes the technical services used throughout the Agency. The TRM is a high-level view of the NASA service areas and how they are related to the general technology layers. It describes the inter-relationship between the services and the user environment, applications, integration, data, and common infrastructure. The TRM is also used for communicating technology component elements such as policies, standards, and product recommendations.

3.22 Technology Architecture

The Technology Architecture is the bottom layer in the architectural hierarchy and is considered to be the foundation upon which all the other IT architectures are built. The architecture or design of the technology is driven by business needs communicated by the design of the three higher architectural layers: Business Architecture, Data Architecture, and Application Architecture.

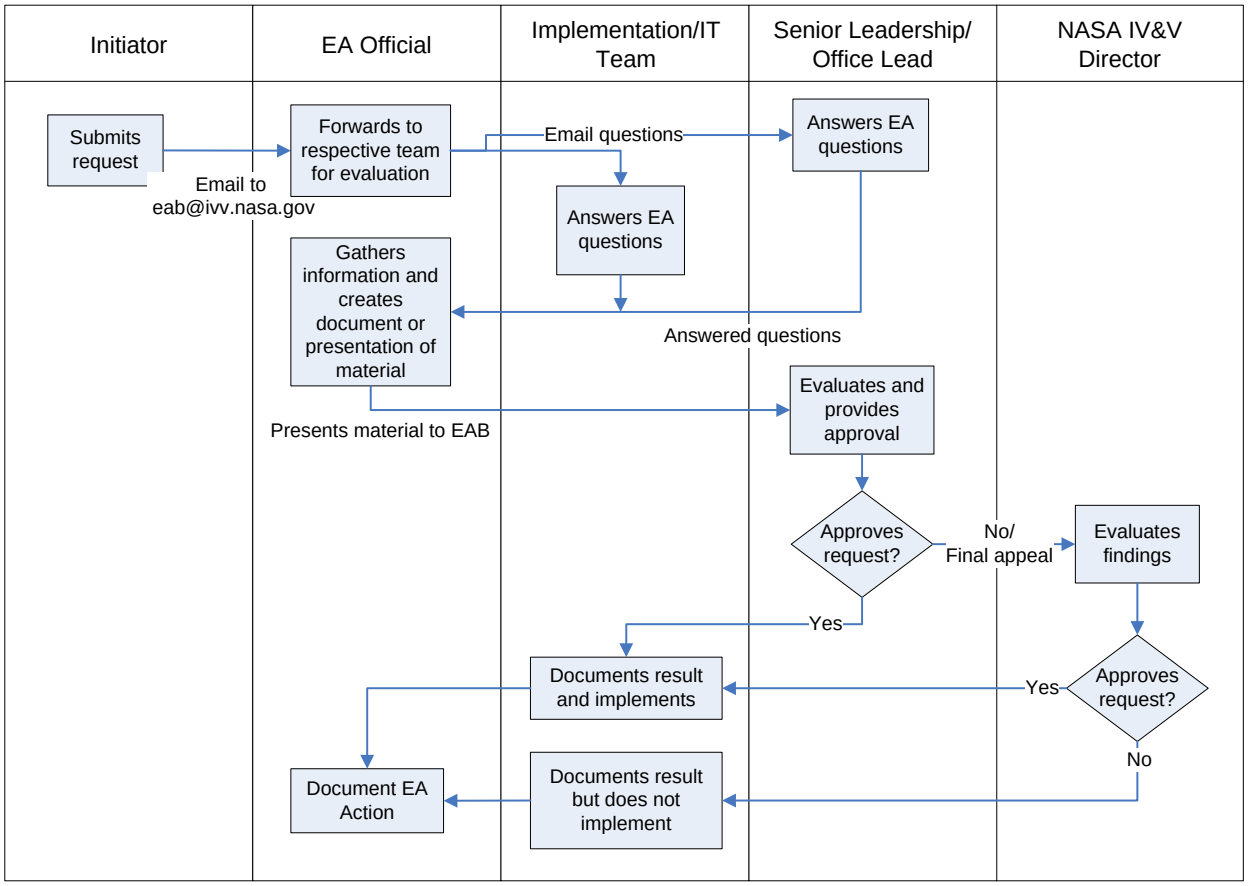
3.23 Acronyms

ACES	Agency Consolidated End-user Services
BRM	Business Reference Model
CMP	Configuration Management Plan
DRM	Data Reference Model
EA	Enterprise Architecture
EAB	Enterprise Architecture Board
ECM	Enterprise Content Management
FY	Fiscal Year
GSFC	Goddard Space Flight Center
IMS	NASA IV&V Management System
IT	Information Technology
JSTAR	Jon McBride Software Testing and Research
NDC	NASA Data Center
NODIS	NASA Online Directives Information System
NPD	NASA Policy Directive
NPR	NASA Procedural Requirements
PFM	Program Financial Management
QM	Quality Manual
SDLC	System Development Life Cycle
SLP	System Level Procedure
SRM	Service Reference Model
SWAT	Software Assurance Tools
TRM	Technical Reference Model
WVU	West Virginia University

4.0 Process Flow Diagram

The following diagram depicts the process described in this document, and the responsibilities and actions that shall be performed by process participants or their designees. Any information supplemental to the depicted process will appear after the diagram.

4.1 EA Request flowchart



4.1.1 EA Request Process

The EA request process shall follow the steps below:

4.1.1.1 Initiator Responsibilities (To answer: Why? What?):

The initiator request shall come in the form of a business justification or statement, and shall be emailed to eab@ivv.nasa.gov.[1] The following questions shall be answered by the initiator along with any other detail that would be beneficial in understanding the value of this capability:

1. Does this action provide added benefits? (If so, what are they? And, how does it improve the Program's capabilities?)
2. What is the capability or need that has brought forth the need to purchase new IT equipment/software/FTE resources for IT? Is there a similar capability that already exists within the organization or somewhere else that can be leveraged that will meet the Program's needs? (If not, what are the specific drivers/needs that exclude what we already have in place?)
3. Have you coordinated with one or all of the IT groups to understand what is currently available that could meet the requirement?
4. Has this been put in the FY Office Execution Plan? (If not, what is this capability?)

4.1.1.2 Senior Leadership/Office Lead responsibilities (To answer: Where? How? Who? When?):

The EA official will send an email to Senior Leadership/Office lead asking to answer the following questions. There may be a need to have a meeting to answer these questions if this is a Program-level request as opposed to a request for a single office.

[1] For example: Request received to allow end-users to access IV&V email from their web-enabled personal cell phones through a direct interface to the IV&V email server interface.

1. Is there appropriate funding (initial and out-year)?
2. Does this action fall within the scope of the NASA IV&V Strategic Plan?
3. Is ownership agreed upon by a respective IV&V Office? This would include implementing and maintaining the tools and providing subject matter expertise to support this capability.
4. Is there any impact/risks or considerations that may affect other IV&V Program functions or capabilities?
5. Where do we plan to extend this IT capability or innovation? (i.e. Is it just something for IV&V internally or is this an externally facing capability? Are there customers involved outside our organization?)
6. Why are we doing this? Is this this something that is driven by a business need or innovation?
7. When do we plan on executing this? This year? Next year? Forever? Short term?

The Initiator may be directed to the EA Official after having requested a resource per IVV 04, *Program Support Office Services Request Process*, or IVV 20, *NASA IV&V SWAT Request Process.*

4.1.1.3 Implementation Team/IT Lead responsibilities (To answer: How?):

The EA official will send an email to the Implementation Team(s)/IT lead asking to answer the following questions. There may be a need to have a meeting to answer these questions if this is a Program-level request as opposed to a request for a single office.

1. Does this action impact other IV&V IT assets in an adverse way?
2. Can this action be implemented effectively (with regard to IT security, technology, and other technical considerations) in the current IT environment? (This action is handled by the implementation team[s] and will take considerably longer to answer as there may need to be in-depth analysis in order to answer this question.)
3. Does this action follow NASA and Goddard Space Flight Center (GSFC) guidelines (i.e. NPR 2810, 7120.5, 7150)?

4. Is this business requirement unique, requiring special attention that cannot be met with the current toolset or IT function?
5. Does this IT capability already exist and does it currently fulfill the capability requested?

Note: If the capability already exists but the Initiator feels that the resource could be improved, or if the capability doesn't exist, then the EA Official will work with the Initiator to identify what is unique regarding this request and document that for the final review.

4.1.1.4 EA Official responsibilities (To ensure that all types of questions are answered and documented (Who? What? When? Where? Why? How?):

The EA official has responsibility to ensure that all parties are aware and have knowledge of each request. The EA official will provide the following:

1. Does this currently comply with the EA "As-Is" Reference and Technical Architecture?
2. Does this action follow NPR 2830.1? (This includes expanded criteria if all the criteria here are not sufficient.)

To identify the best course of action and to ensure all questions have been answered, the EA Official may set up a meeting with the appropriate lead and all affected parties, including the respective Implementation/Program offices/Senior Leadership teams, if there needs to be additional clarification on answers to the questions submitted.

If the request is rejected, the Initiator will have a chance to revise and resubmit the request for review by the NASA IV&V Director. The appeal can happen at any time during the process after one EAB review and requested via the EAB, the Implementation Team, or Initiator.

Methodology for questions:

The purpose of EA at IV&V is to have a governance model to allow for effective and efficient IT services for the IV&V Program. This SLP is written in order to meet objectives which should answer: Who? What? Where? Why? When? and How?

If there is an IT expenditure, then the following elements should be considered:

- Understanding the "Who" element can help ensure that there is inclusion and diversity in the decision-making process and ultimately the final solution for all the rest of the questions.

- Understanding the "What" element is important so that implementation teams (IT, SWAT, JSTAR) can assess the capability effectively and ensure that we are not duplicating services, as well as give the opportunity to those teams to provide advice on implementation, such as "Where" this capability should be implemented.

- Understanding the "Where" element helps us to be efficient and effective at utilizing our current resources. Understanding the answers to the "where" question will also help the organization decide where resources are best suited for the end customer (i.e. NDC, WVU, ACES). There is currently a spreadsheet that helps guide us to make these decisions.

- Understanding the "Why" element gives buy-in for the "Who" so that when the how and what are being determined the "Who" all have the same end goal. If there is no clearly defined end goal, then the why is unclear and can never be met effectively.

Understanding the "When" element helps the organization plan and meet objectives and execution plan milestones effectively. EA usually will do an ROI study on the capability and the overall cost and return on investment for this capability.

- Understanding the "How" element, including how much, gives the organization the ability to plan and prioritize execution for current and out years and adjust resources as needed.

4.1.2 Budget and Planning

Once the questions are answered to the satisfaction of the EAB, the Initiator can move forward with projecting funding and other planning.

The Initiator/Office Lead shall identify dollars in the respective budgets and work with the Program Financial Management (PFM) Group to identify any necessary funding transfers and baseline revisions identified in IVV-07, *Financial Data Control*. All support functions to support maintenance of the tool will be transferred to the respective project.

The Initiator/Office Lead will work with the PFM Group to identify a spending plan for each fiscal year (FY) and will be needed for the request to be approved.

The Initiator/Office Lead will then identify milestones and create a project plan to identify resources needed by other support programs and/or contracts and shall ensure that all procurements are made through a NASA approved procurement vehicle.

4.1.3 Final Implementation

The Initiator will work with Implementation Teams to fulfill the request, providing the Implementation Teams with the following information:

- Project plan with milestones
- Cost plan
- Concept of operations (to provide the Implementation Teams some insight if this is a new idea that is to be implemented with no clear direction already identified)
- Installation and/or implementation plan

The Initiator and/or the Implementation Team will create a Configuration Management Plan (CMP) per IVV 10, *Software and Hardware Configuration Management*, no later than the end of this milestone. The CMP shall be forwarded to the IVV10 Process owner and entered into the CMP Register prior to "Go-Live" date.

4.1.4 Results and Final Documentation

The EA Official will document the results and capture any notes, meeting minutes, and other pertinent information along with an EA number (EA-###) on the Enterprise Content Management (ECM) System.

The EA Official will send the approval or denial of the request via email.

For EAB meetings, all parties (or their alternates) vote on the corresponding request.

If there is insufficient information or a disagreement among any EAB members, then the EAB must either deny the request or have the Initiator rework the request until agreement can be reached.

All EA documentation (including minutes, decisions, and assessments) will be stored in a centrally shared EA repository for reference and EAB review.

4.2 Appeals

EAB decisions may be appealed to the NASA IV&V Director. The NASA IV&V Director has the overall authority to approve an EAB-denied action as long as Program Management is willing to accept the risk and cost associated with the request. This authority shall be exercised only under special circumstances, such as when a mandate is handed down to the Agency and there is not a valid business case, but there is a requirement to implement.

Upon notification of an appeal, the Director will arrange an EAB meeting, at which the member that wishes to appeal shall present the Director with

the risks, costs, issues, and impacts. The Director's decision on that appeal shall be final.

5.0 Metrics

Any metrics associated with this SLP are established and tracked within the NASA IV&V Metrics Program.

6.0 Records

The following records will be generated or updated and filed in accordance with this SLP and IVV 16, *Control of Records*, and in reference to NPR 1441.1, *NASA Records Retention Schedules*.

Record Name	Original	Vital	Responsible Person	Retention Requirement	Location
EA Decisions	Y	Y	EA Official	Cut off when superseded by a new iteration of the EA. Destroy/delete when 7 years old or when no longer needed, whichever is later. (2/26B)	EA Repository
EA Assessments	Y	N	EA Official	Cut off when superseded by a new iteration of the EA. Destroy/delete when 7 years old or when no longer needed, whichever is later. (2/26B)	EA Repository
EAB Meeting Minutes	Y	N	EA Official	Cut off when superseded by a new iteration of the EA. Destroy/delete when 7 years old or when no longer needed, whichever is later. (2/26B)	EA Repository

Note: The above records taken together may be considered the "Final Documentation". Other records created during this process belong to other groups, (e.g. Implementation Plans would belong to the implementing group like SWAT or WVU).

VERSION HISTORY				
Version	Description of Change	Rationale for Change	Author	Effective Date
Basic	Initial Release		Rick Cavanaugh	08/11/2010
A	Update example, terms, and request flow (4.1). Added Budget and Planning flow (4.1.2).	Annual Document review; PAR 2012-P-365: Example was not what is now considered an EA change.	Doug Dorrer	01/31/2013
B	Changed Business Process flowchart and process language. Removed Budget and Planning flowchart.	Clarify the process	Doug Dorrer	03/27/2013
C	Rename document. Update Sections: 1.0, *Purpose*, 3.0, *Definitions*, and 4.1.1, *Initiator Request*. Minor changes to Sections: 2.0, *Scope*, the References table, and the Records table.	Clarify language. PAR: 2013-P-392. In a recent situation the IVV 11 process was not initiated when it may have been appropriate to do so. Clarify required steps in the process by using “shall’s” rather than “may’s” (e.g. “Initiator may request” sounds optional and is reworded since it is intended to be a requirement).	Doug Dorrer	05/14/2014